

CLAIMS

1 The embodiment of the invention in which an exclusive property or privilege is  
2 claimed is defined as follows:

3 1. A method for high spatial resolution imaging of x-ray and gamma radiation  
4 comprising:

5 a) supplying a plurality of sources of radiation; and

6 b) focussing said radiation onto one or more detectors by means of diffracting crystals  
7 having a width not exceeding the resolution;

8 c) analyzing said focused radiation to collect data as to the type and location  
9 of the radiation; and

10 d) producing an image using the data.

11 2. The method as recited in claim 1 wherein the step of supplying said sources  
12 of radiation further comprises contacting a body with a radioisotope.

14 3. The method as recited in claim 1 wherein said image is produced by an array of  
15 detectors.

1     4.     The method as recited in claim 1 wherein the step of arranging said crystals  
2     further comprises cutting said crystals into thin slabs and bending said cut  
3     crystals to assume the shape of circular arcs.

4     5.     The method as recited in claim 1 wherein said width is 1mm or less.

5     6.     The method as recited in claim 1, further comprising selecting said crystals to  
6     have random imperfections and dislocations produce a rocking angle of between 50  
7     and 150 seconds of arc.

8     7.     The method as recited in claim 1 wherein the step of analyzing said focused  
9     radiation further comprises directing said focused radiation to a plurality of  
10    detectors with a resolution of 1 mm or less.

11    8.     The method as recited in claim 1 further comprising positioning one or more  
12    collimators with narrow width apertures between said sources and said detectors and  
13    adjusting the position and widths of said apertures to improve said resolution.

14    9.     The method as recited in claim 4 wherein the step of supplying a plurality  
15    of said sources of radiation further comprises placing at least one of said  
16    sources at precisely known locations.

17    10.    A device for high spatial resolution imaging of a plurality of sources of x-ray and  
18    gamma-ray radiation comprising:

19    a) a means for locating the sources of radiation;

20    b) a plurality of diffracting crystals of a width not exceeding the resolution for focussing  
21    the radiation emanating from the located sources and directing it to a plurality of  
22    detectors;

23    c) detector arrays for analyzing said directed radiation to collect data as to the type  
24    and location of the radiation; and

25    d) a means for converting the data to an image.

1 11. The device as recited in claim 10 wherein the means for locating the sources  
2 is a plurality of scintillation devices.

3 12. The device as recited in claim 10 wherein the diffracting crystals form a  
4 plurality of lenses.

5 13. The device as recited in claim 10, where the diffracting crystals and the sources  
6 are movable.

7 14. The device as recited in claim 10 wherein the radiation sources are  
8 radioisotopes.

9 15. The device as recited in claim 12 wherein each lens comprises a  
10 plurality of crystals and wherein the crystals are oriented so as to diffract  
11 radiation of a predetermined energy to the same focal point.

10 16. The device as recited in claim 12 wherein the crystals are mounted in concentric  
11 rings onto a substrate.

12 17. The device as recited in claim 12 wherein the crystals are bent.

13 18. The device as recited in claim 10 further comprising one or more collimators with  
14 apertures positioned medially between the sources and the detectors and wherein the  
15 width and position of said apertures is adjustable.

16 19. The device as recited in claim 10 wherein said crystals contain random  
17 imperfections and dislocations that produce a rocking angle of between 50 and 150  
18 seconds of arc.

- 1     20.    The device as recited in claim 10 wherein said detectors in said detector arrays  
2     have a resolution of 1 mm or less.